2010 GREENHOUSE GAS EMISSIONS INVENTORY

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SUMMARY

As part of Chula Vista's climate protection program and its commitment to reduce greenhouse gas (GHG) or "carbon" emissions 20% below 1990 levels, the Department of Public Works' Conservation Section performs emissions inventories to identify GHG sources and to help guide policy decisions. The 2010 GHG Emissions Inventory is the City's latest evaluation of its progress in reaching its emissions goals and builds upon past inventory efforts for 1990, 2005, 2008 and 2009. The 2010 inventory utilizes the Local Government Operations Protocol (version' 1.1) which is sponsored by ICLEI, the California Climate Action Registry, The Climate Registry, and the California Air Resource Board.

The 2010 inventory indicates that Chula Vista's annual citywide GHG levels are 969,596 metric tons of carbon dioxide equivalent (MT CO_2e). Compared to base year 1990, Chula Vista's citywide GHG emissions have increased by 33%. Compared to last year's report (inventory year 2009), citywide GHG emissions have increased by 2%. However, 2010 per capita emissions are approximately 24% below 1990 levels. GHG emissions from municipal sources (i.e. operations, facilities, and vehicle fleet) in 2010 were also lower than 1990 and 2009 levels, approximately 53% and 11% respectively.

Similar to inventory year 2009, there was a reduction in citywide energy consumption in 2010 due most likely to the global economic downturn (approximately 1% decrease from 2009). In addition, SDG&E's percentage of grid-supplied renewable energy continues to increase, further contributing to lower energy-related emissions. Conversely, community transportation activity has continued increasing each year with the 2010 vehicle miles traveled (VMT) projected to be about 6% higher than 2009 (causing a 5% GHG increase). In order to reach the community emissions reduction commitment of 20% below the base year 1990, the City will have to reduce its GHG emissions by more than 387,960 MT CO_2e.

INTRODUCTION

Chula Vista has historically been a regional and national leader in climate protection policies and programs designed to reduce greenhouse gas or "carbon" emissions. The City has participated in the United Nations Framework Convention on Climate Change, ICLEI Cities for Climate Protection Campaign, and the Conference of Mayor's Climate Protection Agreement. In addition, Chula Vista has reported 2008, 2009, and 2010 municipal emissions to The Climate Registry, which is North America's premier voluntary greenhouse gas (GHG) reporting system designed to archive participants' early actions to reduce GHG emissions. Through this past

involvement, the City has committed itself to reducing its greenhouse gas emissions 20% below 1990 levels by 2010 based on a widely-adopted international target. It should be noted that the international community has since revised the reduction target date to 2012.

The City of Chula Vista's Greenhouse Gas Emissions Inventory for calendar year 2010 was compiled and calculated using the Local Government Operations Protocol version 1.1 (LGOP v1.1) and ICLEI's Clean Air & Climate Protection 2009 software (Version 2.2.1). The LGOP is sponsored by ICLEI, the California Climate Action Registry, The Climate Registry, and the California Air Resources Board and allows local governments to better estimate their annual greenhouse gas emissions from municipal-operated sources. The software also calculates the emissions from major community sources in order to help further shape local climate change policy and goals. The most recent emission coefficients specific to California and/or the San Diego region were used in all quantifications. As such, past years' (2008 and 2009) emission levels were recalculated because new emission coefficient data was available, thus providing a more accurate comparison between inventory years.

As stated above, the 2010 GHG Emissions Inventory separates emissions into two major analyses: community and municipal. The community analysis represents the quantity of GHG emissions produced throughout the entire City from both public and private sectors. The municipal analysis only represents emissions from City facilities and operations. In both analyses, the protocol evaluates emissions from three main parameters - energy consumption, transportation, and waste. It is important to clarify that these data parameters are based solely on "end use" or net results. For example, the City's emissions from electricity are calculated based on the total kilowatts used, not the kilowatts saved in City-sponsored efficiency programs. Although there are six greenhouse gasses outlined in the Kyoto Protocol; carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), the inventory calculates emissions based on CO_2 equivalent or CO_2e which allows emissions of different strengths to be added together. For example, one metric ton of methane is equivalent to 21 metric tons (MT) of carbon dioxide in global warming potential (or CO_2e).

In addition to outlining its 2010 inventory results in this report, the City has formally submitted its municipal inventory to The Climate Registry (TCR) for public review and vetting. The Climate Registry is a more robust greenhouse gas accounting procedure requiring third-party verification. Participation in TCR complements the City's other climate protection efforts by documenting GHG emissions as it relates to Assembly Bill 32's (California Global Warming Solutions Act of 2006) statewide reduction targets and prepares the City for potential carbon trading opportunities in the future. The City of Chula Vista is the only local city in San Diego County to successfully report its GHG emissions through The Climate Registry. The City of Chula Vista is also the only local city in San Diego County to participate in San Diego Gas & Electric's Cool Planet Program, which reimburses the City's costs for preparing and verifying its GHG emissions inventory. The City is eligible to participate in the Cool Planet Program because of its aggressive energy efficiency retrofit efforts on its municipal facilities. It should be noted that the total municipal emissions reported in this inventory report differ from the total emissions submitted to TCR due to its slightly different carbon accounting methodology.

RESULTS

With technical assistance from ICLEI, City staff collected "activity data" from a number of municipal and external sources, including CalTrans, SDG&E, CalRecycle, the Chula Vista Recreation Department, and the Public Works Department (Table 1). In most cases, the data sources were able to provide aggregated empirical data for calendar year 2010. However, for community transportation levels it was necessary to forecast 2010 data using a 3-year rolling average. According to the CalTrans' Highway Performance Monitoring Systems (HPMS), there was an average increase of 5.5% in vehicle miles traveled (VMT) per year from 2007 to 2009. Due to the fact that 2010 data has not been published yet, this 5.5% average increase is used to estimate the VMT for 2010. This number will be updated in future inventory reports as more accurate data becomes available.

PARAMETER	ANALYSIS	SOURCE	ACTIVITY DATA	EMISSION FACTOR
Energy	Community	SDG&E	- Metered electricity & natural gas use - Local power generation plants excluded from Industrial Sector's natural gas totals in order to avoid double counting emissions	- SDG&E-specific electricity emission coefficients (CO_2) - CA average electricity emission coefficients (CH_4 & N_2O) - Default natural gas emission coefficients
	Municipal	SDG&E	- Metered electricity & natural gas use - Fuel shipment invoices - Energy consumption was categorized by buildings, outdoor lighting, and wastewater	
Transportation	Community	CalTrans	- Annual VMT data (excluding freeways) was derived from average daily VMT values for Chula Vista	- Default fuel emission coefficients - Default occupancy & vehicle classes (*community analysis only*)
	Municipal	Public Works Dept.	- Fuel consumption totals include transit and equipment use	
Waste	Community	CIWMB	- Solid waste disposal data for Chula Vista residents and businesses at all California landfills	- Default fugitive methane (CH_4) emission estimates (based on EPA WARM Model) - Methane capture rates at Otay Landfill
	Municipal	Allied Waste Services	- Solid waste disposal data includes trash hauled by Allied Waste Services and by City staff	
Other	Municipal	Recreation Dept.	- pH canisters' shipment invoices	- Default fugitive carbon dioxide (CO_2) emissions coefficients

Table 1: Data sources and emission factors used for community and municipal emissions analyses.

Default emission coefficients and related assumptions were generally used for transportation and waste analyses. For energy analyses, staff included Utility-specific electricity coefficients for CO_2 emissions. If these coefficients were not available for a particular inventory year (or prior year), the California Grid Average electricity emission coefficients were used. All inventories used the California Grid Average electricity coefficients for CH_4 and N_2O emissions for the particular year (or most recently available year). This approach is consistent with the Local Government Operations Protocol and preferred by the California Air Resources Board, The Climate Registry, and ICLEI for GHG reporting.

Community Inventory

In 2010, community GHG emissions from Chula Vista totaled 969,596 MT CO_2e (Table 2, Figure 1). The sector with the greatest amount of emissions (more than 50% of total community emissions) was transportation or mobile sources. The residential sector was the second highest source producing a quarter (26%) of total community emissions from energy use, followed by the commercial (19%) and industrial (3%) sectors. Because of the high methane recovery rates at County landfills, the community did not have significant emissions from solid waste disposal.

Compared to 2009 emission levels, 2010 total emissions from citywide sources have increased by 2%. Emissions from the energy sector have decreased by 2% since 2009. The decrease between the two inventory years was due to reductions in overall energy use with emissions from residential, commercial, and industrial energy use decreasing by 8,128 MT CO_2e cumulatively. Transportation-based emissions are estimated to have increased 5% or 23,993 MT CO_2e since calendar year 2009.

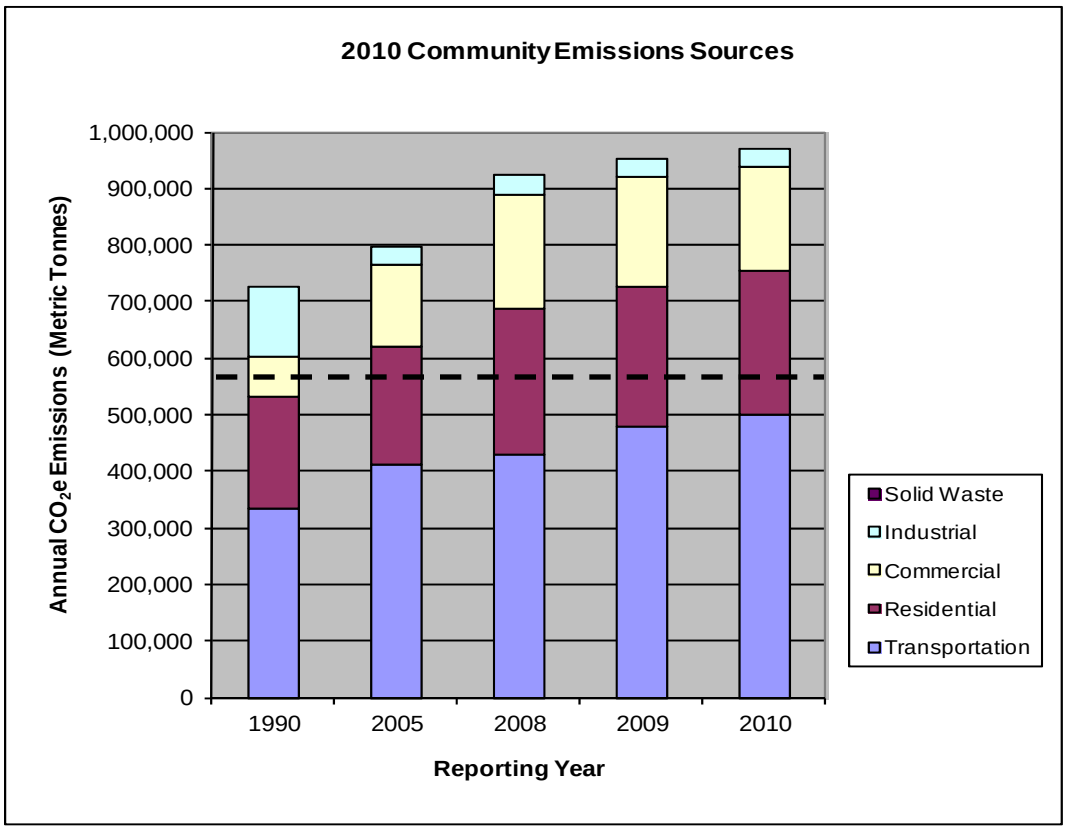

Figure 1: Total GHG emissions from community sources (by sector) in 1990, 2005, 2008, 2009, and 2010. Emissions from the solid waste sector were non-significant (<1 MT CO_2e) and are not graphed. Dashed line represents carbon reduction commitment.

When comparing Chula Vista's 2010 citywide GHG emissions to baseline year 1990 levels, 2010 emissions increased by approximately 33% (Figure 1). The City's residential energy emissions increased approximately 28%, while the commercial energy sector increased emissions by more than 100%, when compared to the baseline year. The industrial sector

Table 2: Community Analysis - 1990, 2005, 2008-2010 Inventory Years

Annual Consumption (Metric Units)								
		1990	**2005**	**2008**	**2009**	**2010**	**% Change** (2010 vs. 1990)	**% Change** (2010 vs. 2009)
Population		135,136	217,543	231,305	235,006	237,595	76%	1%
Housing Units		49,849	73,115	77,452	77,787	78,244	57%	1%
Land Area (Acres)		18,558	33,024	33,024	33,042	33,042	78%	0%
Annual Vehicle Miles Traveled (VMT)		465,300,000	684,564,800	727,101,900	814,227,400	859,482,100	85%	6%
Energy Use (MMBtu)	**Residential**	2,438,280	3,416,724	3,641,904	3,531,753	3,614,601	48%	2%
	Commercial	767,716	2,305,220	2,557,321	2,514,921	2,430,856	217%	-3%
	Industrial	1,342,551	485,504	388,748	390,358	343,868	-74%	-12%
	Total	4,548,547	6,207,448	6,587,973	6,437,032	6,389,325	40%	-1%
Solid Waste (Tons)		179,986	217,881	174,583	188,733	159,623	-11%	-15%

Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO2e)								
		1990	**2005**	**2008**	**2009**	**2010**	**% Change** (2010 vs. 1990)	**% Change** (2010 vs. 2009)
Per Capita		5.4	3.7	4.0	4.1	4.1	-24%	1%
Per Housing Unit		14.6	10.9	11.9	12.3	12.4	-15%	1%
Per Acre		39.2	24.2	28.0	28.9	29.3	-25%	2%
Transportation ($MTCO_2e$)		335,435	412,306	428,684	477,484	501,477	50%	5%
Energy Use ($MTCO_2e$)	**Residential**	197,115	207,533	259,140	248,817	251,902	28%	1%
	Commercial	71,363	146,245	199,904	192,781	185,698	160%	-4%
	Industrial	123,128	32,013	35,812	34,649	30,519	-75%	-12%
	Total	391,606	385,791	494,856	476,247	468,119	20%	-2%
Solid Waste ($MTCO_2e$)		0	0	0	0	0	0%	0%
Total GHG Emissions ($MTCO_2e$)		727,041	798,097	923,540	953,731	969,596	33%	2%
20% GHG Reduction Goal						581,632		
Reductions Needed To Reach Goal						387,963		

* All GHG emissions are reported in CO_2 Equivalent (CO_2e) which allows emissions of different strengths to be added together. For example, one metric ton of methane emissions is equivalent to 21 metric tons of carbon dioxide (or CO2e) in global warming potential.

decreased its emissions by 92,609 MT CO_2e (75%) between the two inventory years. This decrease was most likely due to more accurate energy tracking in recent years (see page 9). Emissions from transportation activity were about 50% greater in 2010 compared to 1990. Similar to past inventories, emissions from Chula Vista solid waste disposal at County landfills continued to remain insignificant in 2010.

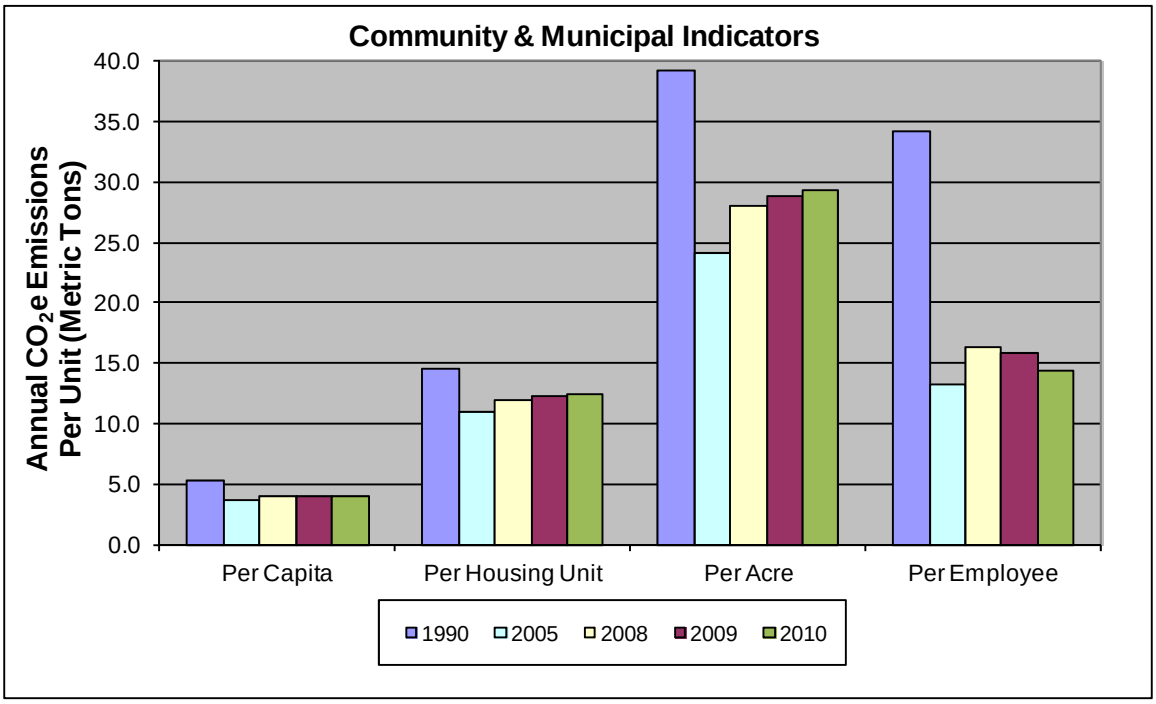

Figure 2: Per capita, household, acre, and City employee contributions to GHG emissions in 1990, 2005, 2008, 2009, and 2010.

Although there was an increase in total community emissions from 1990 to 2010, the amount of GHG emissions per person, per household, and per acre decreased (Figure 1). The per capita emissions rate decreased 24% from 5.4 to 4.1 MT CO_2e annually, per household emissions decreased 15% from 14.6 to 12.4 MT, and per acre emissions decreased 25% from 39.2 to 29.3 MT CO_2e. Nonetheless, in order to achieve the City's 2010 GHG reduction target, annual community emissions would be required to be reduced by at least an additional 387,963 MT CO_2e annually.

Municipal Inventory

Chula Vista's 2010 municipal GHG emissions were 13,776 MT CO_2e (Table 3, Figure 3). The majority of emissions came from the City's vehicle fleet which accounted for 48% of total emissions. Buildings accounted for 33%, external lighting (traffic control signals and street lights) accounted for 19%, and wastewater pumping was <1% of total emissions. This followed a similar trend set by the community inventory in which transportation accounted for nearly half of total emissions followed closely by building energy usage.

Table 3: Municipal Analysis - 1990, 2005, 2008-2010 Inventory Years

Annual Consumption (Metric Units)								
		1990	**2005**	**2008**	**2009**	**2010**	**% Change** (2010 vs. 1990)	**% Change** (2010 vs. 2009)
Employees		866	1,198	989	979	960	11%	-2%
Vehicle Fleet Fuel Use (Gallons or Equivalent)		478,344	1,102,823	923,364	947,109	815,442	70%	-14%
Energy Use (MMBtu)	**Buildings**	35,527	70,790	65,439	63,709	58,084	63%	-9%
	External Lights	147,100	27,780	30,422	28,297	27,086	-82%	-4%
	Sewage	7,122	257	480	216	218	-97%	1%
	Total	189,749	98,827	96,341	92,222	85,388	-55%	-7%
Solid Waste (Tons)		5,400	6,603	7,331	8,269	7,373	37%	-11%

Annual Greenhouse Gas (GHG) Emissions (Metric Tons CO_2e)								
		1990	**2005**	**2008**	**2009**	**2010**	**% Change** (2010 vs. 1990)	**% Change** (2010 vs. 2009)
Per Employee		34.2	13.3	16.4	15.9	14.3	-58%	-10%
Vehicle Fleet		4655	9282	7801	7848	6617	42%	-16%
Energy Use	**Buildings**	3728	4576	5330	4956	4531	22%	-9%
	External Lights	20260	2032	3004	2723	2607	-87%	-4%
	Sewage	981	19	47	21	21	-98%	0%
	Total	24969	6627	8381	7700	7159	-71%	-7%
Solid Waste		0	0	0	0	0	---	---
Total GHG Emissions		29,624	15,908	16,182	15,548	13,776	-53%	-11%
20% GHG Reduction Goal						23,699		
Reductions Needed To Reach Goal						0	*Goal Obtained	

* All GHG emissions are reported in CO_2 Equivalent (CO_2e) which allows emissions of different strengths to be added together. For example, one metric ton of methane emissions is equivalent to 21 metric tons of carbon dioxide (or CO2e) in global warming potential.

Compared to 2009 emission levels, total municipal emissions in 2010 have decreased by 11% or 1,772 MT CO_2e. This reduction is significantly more then the reduction from 2008 to 2009 (2009 reported 7% decrease in total municipal emissions). The largest decrease in 2010 came from the vehicle fleet sector which decreased by 16% or 1,231 MT CO_2e. Buildings decreased by 9% and external lighting decreased by 4% (or 425 and 116 MT CO_2e, respectively). Sewage pumping experienced no significant change in emissions from last year, since no changes were made to the system.

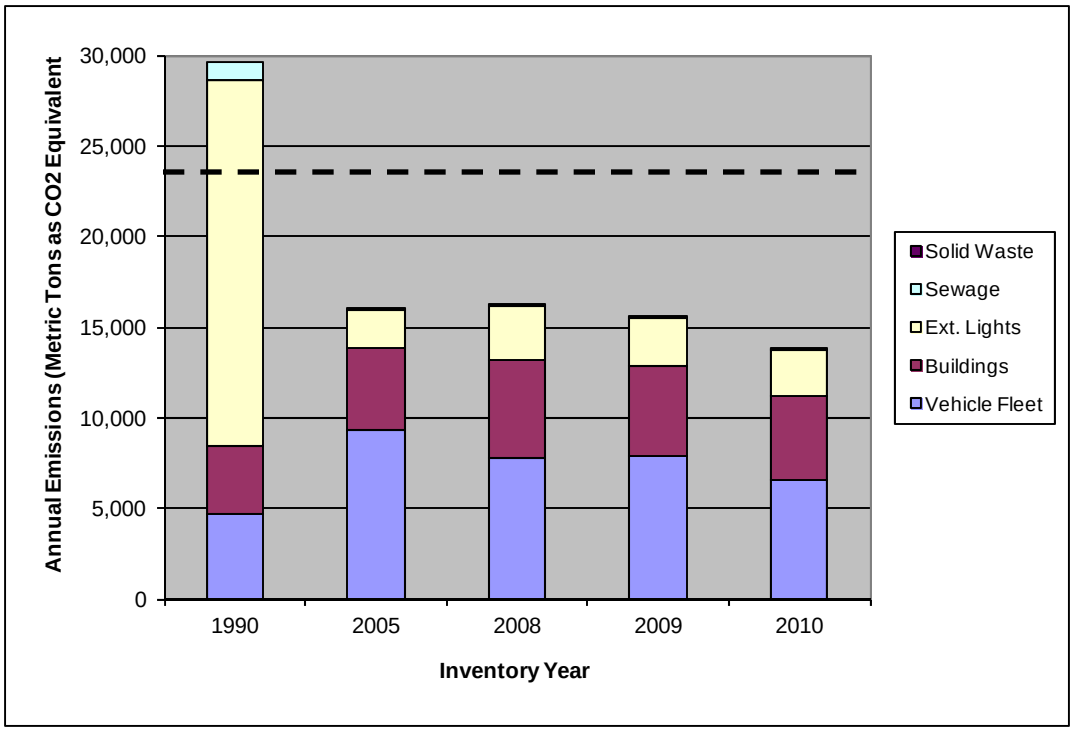

Figure 3: Total GHG emissions from municipal sources (by sector) in 1990, 2005, 2008, 2009, and 2010. Emissions from the solid waste sector were non-significant (<1 MT CO_2e). Dashed line represents carbon reduction commitment.

When compared to 1990 levels, GHG emissions from municipal operations decreased by 15,848 MT CO_2e (53%) and emission levels per City employee (full-time equivalent) decreased 58% (Table 3). These reductions were mainly a result of decreased consumption of electricity from the external lighting sector, which includes streetlights and traffic signals. Due to energy-efficiency retrofit efforts over the past 20 years, the external lighting sector was able to decrease its emissions by 17,653 MT CO_2e (87% decrease). Sewage sector emissions also decreased by 98% resulting in only 21 MT CO_2e being produced in 2010. However, this reduction is most likely due to differences in how pump station energy meters were segregated out of the dataset between the two inventory years. The municipal building sector increased its emissions 22% or 803 MT CO_2e since 1990 as new buildings and facilities have been constructed and expanded. Likewise, the municipal fleet sector, which includes Chula Vista Transit, increased its emissions by 1,962 MT CO_2e which is 42% higher than 1990. Similar to past inventories, emissions from municipal solid waste disposal at County landfills continued to be insignificant in 2010.

DISCUSSION

Municipal Emissions

As evident by the 2010 reporting statistics, the City of Chula Vista has continued to lower its GHG emissions associated with municipal operations. Overall municipal energy consumption has been considerably reduced since 1990. The major cause of the emissions decrease was the installation of LED traffic signals in the mid-1990s. Although building energy consumption has increased since the traffic signal retrofits, building energy use has decreased over the past 2 inventory years. This trend is mainly due to construction and renovation of numerous municipal administrative buildings, recreation centers, and fire stations between 2000 and 2008 and, more recently, completion of Municipal Energy Upgrade Projects (Phase A) in 2010 that included energy-saving improvements to the Police Headquarters and Civic Center Library's HVAC systems, installation of energy efficient lighting at the Public Works Corp Yard, South Chula Vista Library, and Parkway Recreation Center, and installation of a condensing boiler and solar hot water system at the Loma Verde Recreation Center. In total, the thirty-four Phase A retrofit projects generated annual energy savings of over 1.2 million kWh and 49,000 therms.

Emissions from the municipal vehicle fleet have also decreased 16% between the two recent inventory years, mainly due to fuel usage reductions of approximately 70,000 gallons. In addition, the City constructed a 12,000-gallon biodiesel tank at the Public Works Corp Yard in late 2010 allowing approximately 125 heavy-duty vehicles to switch to the low carbon fuel source. Also, contracted transit vehicles operated by Chula Vista Transit completed a 100% transition to alternative fuel sources, which has helped them reduce emissions from operating their fleet in Chula Vista.

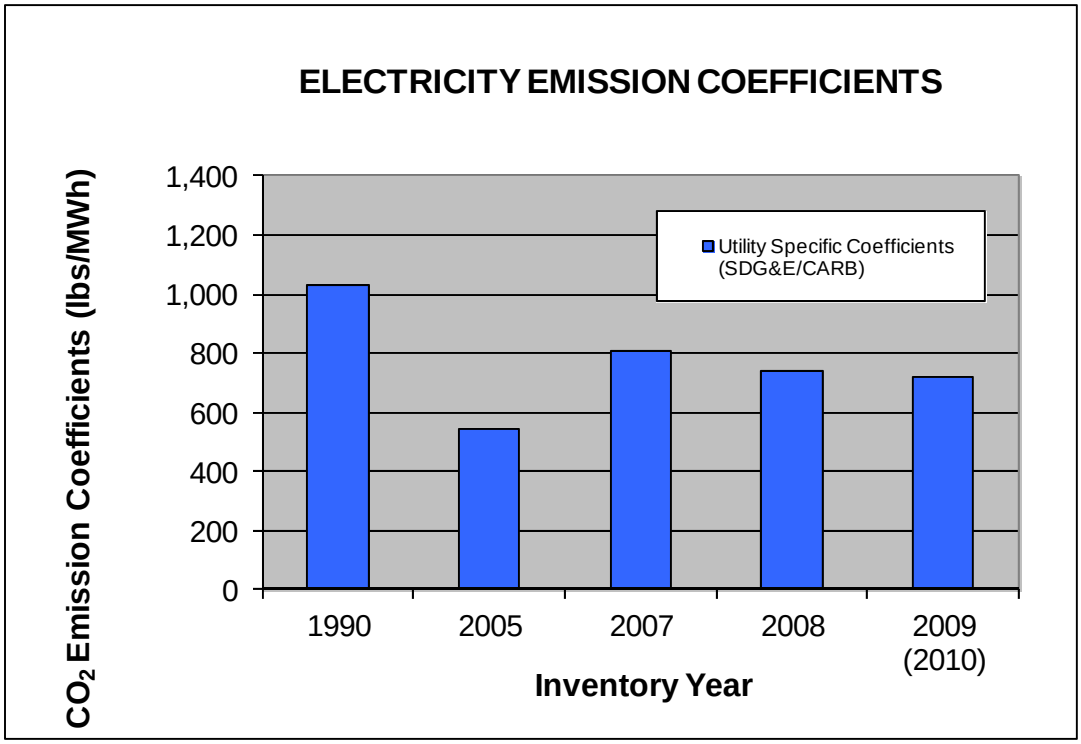

Figure 4: Carbon Dioxide (CO_2) emission coefficients from delivered grid electricity in 1990, 2005, 2008, and 2009.

Community Emissions

Although the City has had significant success in lowering GHG emissions from municipal operations, reducing community-wide GHG emissions has been a challenge. GHG emissions from total community energy use are 20% higher since 1990; however, emissions are down 2% since 2009. The decrease over the last two inventory years can be attributed to lower energy use in the commercial and industrial sector. Additionally, the carbon "intensity" of SDG&E grid-delivered electricity is slightly lower (Figure 4) causing overall GHG emissions from electricity use to decrease. It is also important to note that a portion of the recent reductions may be caused by a local economic downturn (from more vacant building space, reduced hours of operation, etc.) and may be reversed as the economy rebounds in the future.

The City also continues to address the energy use of existing commercial and residential buildings through the Free Resource & Energy Business Evaluation (FREBE) and Home Upgrade, Carbon Downgrade (HUCD) programs, respectively. Nearly 2,500 businesses have participated in the FREBE program since its inception and approximately 63% of surveyed participants have implemented at least one of the City's recommendations for lowering their energy use and monthly utility costs. Likewise, over $250,000 in appliance rebates and home retrofit incentives have been provided to Chula Vista residents through the HUCD program to help lower their home energy use. To complement these existing building efficiency programs, the City has successfully been implementing its Green Building Standard, which has resulted in over 268 new residential and commercial units exceeding California energy efficiency requirements by 15-20%.

The transportation sector is clearly the main factor driving the higher community-wide GHG emissions with annual VMT increasing 85% since 1990. Since 2010 transportation data was not available, emissions had to be extrapolated from VMT data from the three most recent years. Upon availability of new 2010 data, these emission estimates may be revised. Because of the historic and continued VMT growth, transportation represents the highest priority sector for managing Chula Vista's community-wide GHG emissions. While it is difficult to reduce transportation-related emissions due to long-standing land use form and commuting patterns, there are regional, state, and federal programs that are beginning to actively target this sector (see the Next Steps section for more info). Likewise, the City continues to integrate "smart growth" design principles into its development review and approval process that may further help Chula Vista address these emissions.

NEXT STEPS

The City of Chula Vista will continue to implement the City Council-approved *Climate Action Plan* to address the threat of climate change to the local community. The *Climate Action Plan*, which originally was adopted by City Council in 2000, was updated in 2008 to include 7 additional climate "mitigation" measures designed to reduce greenhouse gas emissions by improving energy and water efficiency, expanding renewable energy systems, converting to more fuel efficient and alternative fuel vehicles, and designing transit-friendly, walkable communities. In 2011, these measures were complemented by 11 new climate "adaptation" strategies designed to reduce Chula Vista's vulnerability to expected local climate change impacts such as hotter and drier weather, diminished imported water supplies, more poor air quality/heat wave days, more

frequent wildfires, shifts in habitat and species distribution, and increased rates of sea level rise. Some of these climate adaptation strategies – specifically strategies #1 (cool paving), #2 (shade trees), #3 (cool roofs), #4 (water reuse), and #5 (storm water pollution prevention and reuse) – will also likely contribute to reducing community-wide GHG emissions through energy and water efficiency benefits as they begin to be implemented over the next three years. To continue to address municipal emissions, the City is currently completing its Municipal Energy Upgrade Projects (Phase B), which includes additional HVAC improvements at the Public Works Corp Yard, retrofitting over 4,000 streetlights with LED technologies, and installing almost 500 kW of solar photovoltaic (PV) systems on 11 municipal facilities. These new systems are estimated to help the City save over $100,000 in annual electricity costs and prevent the emission of nearly 500,000 pounds of CO_2.

The City of Chula Vista's carbon reducing efforts will be complemented by a variety of regional, state, and federal initiatives over the next decade. At the regional level, SANDAG has recently approved its Regional Transportation Plan, which includes a Sustainable Communities Strategy for reducing GHG emissions from passenger vehicles and light-duty trucks. This is the first formal effort under Senate Bill 375 to link land use planning choices with regional transportation planning performed by SANDAG and other metropolitan planning agencies for climate mitigation purposes. At the state level, transportation emissions will also begin to be addressed through the Low-Carbon Fuel Standard that seeks to reduce fuel carbon intensity by at least 10% by 2020. San Diego Gas & Electric and other Investor Owned Utilities will now be required to provide at least 33% of their energy portfolio from renewable sources by 2020, which will greatly contribute to statewide and local GHG emission reductions from the energy sector. Finally, the federal government recently increased fuel efficiency standards for passenger and light-duty trucks to fleet-wide averages of 35 MPG by 2016. This nationwide standard was spurred by California's Assembly Bill 1493 (Pavley) that pushed for higher efficiency standards for vehicles in California.

To better understand the impact of these local, regional, state, and federal initiatives on the City's carbon reduction goals, staff will be working over the next 6 months to perform a "gap" analysis. This quantitative exercise involves forecasting community emissions in 2020 and calculating the GHG emission reductions resulting from planned local, regional, state, and federal climate action measures. In the end, the analysis will allow staff to determine if there is a "gap" between expected 2020 emissions levels and the City's GHG emissions reduction goal. As part of this effort, the City will also reevaluate its original emissions reduction goal (to reduce emissions 20% below 1990 levels) to determine if it needs to be updated, accordingly. Based on results from other municipal governments, who have undergone a similar exercise, the City may also consider shifting its baseline year to 2005 to be consistent with Assembly Bill 32 (the California Global Warming Solutions Act) and other state guidelines. Finally, in an effort to broaden the scope of information provided as a part of its GHG emission inventories, the City will begin to incorporate a more detailed analysis related to materials management, which will better track emission reductions from Chula Vista recycling and composting efforts.